ER/WM&I DDT

Source/Driver: (Name & Number from ISP, IAG milestone, Mgmt. Action, Corres. Control, etc.)

Closure #: (Outgoing Correspondence Control #, if applicable)

Due Date __

J. P. Schmuck
Originator Name

G. DiGregorio
QA Approval

ALf for
J. E. Law
Contractor Manager(s)

L. Butler
Kaiser-Hill Program Manager(s)

A. D. Rodgers
Kaiser-Hill Director

Document Subject:

TRANSMITTAL OF NOTIFICATION TO EPA OF A MODIFICATION TO THE OU7 PASSIVE SEEP INTERCEPTION AND TREATMENT SYSTEM IM/IRA - JEL-110-98

KH-00003NS1A June 18, 1998

Discussion and/or Comments:

Enclosed please find ~~three (3)~~ 4 copies of a notification to EPA of a modification to the OU7 Passive Seep Interception and Treatment System IM/IRA. The modification involves using passive air stripping in lieu of granulated activated carbon. The modification will provide waste minimization and cost savings.

Please review the modification and forward copies to DOE. If you have any questions or comments please contact John Schmuck at extension 4092.

Enclosures:
As Stated

JPS/aw

cc:
J. Schmuck
ER Records

6/23/98

Tim Rehder
United States Environmental Protection Agency
Rocky Flats Project
999 18th Street, Suite 500
Denver, CO 80202-2466

NOTIFICATION OF MINOR MODIFICATION TO THE MODIFIED PROPOSED ACTION MEMORANDUM FOR THE PASSIVE SEEP INTERCEPTION AND TREATMENT OPERABLE UNIT 7, REV. 1, MARCH 1996

By this correspondence, the U.S. Department of Energy/Rocky Flats Field Office (DOE-RFFO) is notifying the Region VIII Environmental Protection Agency of a minor modification to the Proposed Action Memorandum for the Passive Seep Interception and Treatment Operable Unit 7, Revision 1, March 1996, pursuant to ¶25as. and ¶126 of the Rocky Flats Cleanup Agreement (RFCA). The Passive Seep Interception and Treatment System (PSITS) presently uses granulated activated carbon (GAC) to treat the volatile organic compounds (VOCs) that are present in the seep at levels slightly above stream standards. DOE is proposing to substitute passive air stripping for the GAC. The passive air stripping is better suited to treating the VOCs of concern.

The minor modification is supported by recent water sampling that was performed to evaluate the treatment system. A minor modification is appropriate because the change in operation of the treatment system will achieve substantially the same level of performance, will not cause the system to exceed an effluent limit and is not a significant departure from the original decision document (id.).

DOE has included three documents in support of this minor modification request. The first attachment, entitled Evaluation of Water Treatment Activities at OU7, documents the results of the Plan for Evaluating Water Treatment Activities at OU7. The approved evaluation plan was dated May 28, 1997.

The second attachment is entitled the Revised Present Landfill Passive Seep Interception and Treatment System Design Change - Modification to the Proposed Action Memorandum. This attachment describes the proposed change to the design of the PSITS.

The third attachment is entitled the Revised Present Landfill Passive Seep Interception and Treatment System Operational Framework - Modification to the Proposed Action Memorandum (Revised Operational Framework). The Revised Operational Framework is intended to supersede the existing PAM and the existing Operational Framework. In this way the PSITS Operator will have a single document that provides a clear and complete understanding of active compliance obligations.

Paragraph 126 of the Rocky Flats Cleanup Agreement requires that DOE give the Lead Regulatory Agency seven days notice prior to implementing any minor modification. Although RFCA does not require written approval, DOE will contact you in several days to answer questions or address concerns you may have about the proposal.

We look forward to discussing your thoughts on the proposed modification. If you have questions or comments please contact me at (303) 966-4839, or Norma Castaneda of my staff at (303) 966-4226..

Steve Slaten
Manager, Regulatory Liaison

Enclosures:
As Stated

cc: Carl Spreng, CDPHE

ATTACHMENT 1

Evaluation of Water Treatment Activities at the Passive Seep Interception and Treatment System

Objectives

The first objective was to evaluate the current volatile organic compound (VOC) and semivolatile organic compound (SVOC) contaminant levels in the influent to the treatment system. The second objective was to evaluate the carbon changeout frequency required to meet the concentration limits (applicable or relevant and appropriate requirements, or "ARARs") applicable to the discharge.

Conclusion

Two constituents, benzene and vinyl chloride, were detected in the influent at levels slightly above the current stream standards-based ARARs for the OU7 Passive Seep Interception and Treatment System (PSITS).

Installation of new GAC will be required on a monthly basis to consistently attain ARARs. The frequency of GAC changeout is due to the fact that neither benzene or vinyl chloride are amenable to treatment using granular activated carbon. The two constituents in question are better suited to air stripping.

Background

The PSITS is a passive treatment system which utilizes GAC to reduce the concentration of VOCs and SVOCs in the seep that originally emanated from the toe of the Present Landfill. The PSITS is comprised of:

- a seep intercept system
- a settling basin to remove suspended solids
- a bag filtration system consisting of two 25 micron bag filters operated in parallel to remove residual suspended solids
- two 55-gallon drums of GAC piped in series.

The PSITS consists of perforated pipe laid in a gravel bed. Seep water collects in the perforated pipe and is piped to a pre-cast concrete basin which allows suspended solids to settle and serves to equalize the head on the system. The settling basin was equipped with a bypass line which allows the influent, or a portion thereof, to bypass the treatment system during routine maintenance or when the flow rate of the seep water is greater than the maximum system design flow rate. A pipe discharges from the settling basin into bag filters which remove particles greater than 25 microns from the influent.

After filtration, the seep water flows through two 55-gallon drums of GAC. The GAC removes select VOCs and SVOCs. The GAC drums are located in a below-ground carbon steel tank which serves as a secondary containment for the system. When two GAC drums are in use they are operated in series in lead and polish positions. When breakthrough occurs from the lead drum, the polish drum is moved to the lead position and a new GAC drum is placed in the polish position. The effluent from the polish position (i.e. the treatment system effluent) is discharged by gravity to the East Landfill Pond.

Current Operations

With one exception, the PSITS is currently operated in accordance with the Operational Framework and associated Sampling and Analysis Plan (PSITS SAP) submitted by DOE to EPA and CDPHE on November 25, 1996. The Operational Framework was intended to clarify and document issues associated with the management and operation of the PSITS. The one exception is that GAC is currently being changed out on a monthly basis. The monthly changeout is based upon the results of this evaluation. The monthly changeout will continue until this PAM modification is approved.

Summary of the Technical Approach to the Evaluation

Sampling and analysis for VOCs and SVOCs was performed in accordance with the PSITS SAP. On day zero of the evaluation, two new 55-gallon drums of GAC were put on line, in series. Samples were taken from four locations- in the influent to the treatment system; after the lead GAC unit; in the treatment system effluent after the polish unit; and in the landfill pond.

Each location was sampled after one week, one month, and two months. After the two month sampling event, the lead GAC was taken off line and the polish GAC was moved into the lead position. A fresh drum of GAC was then placed in the polish position. That type of rotation reflected the ongoing management practice. When the two month rotation was completed, each location was again sampled after one week, one month and two months.

The exact day of sampling was not critical. As a result, sampling was coordinated with other maintenance activities. Regardless, the sampling schedules for the two study cycles were approximately equivalent. An additional sampling was performed on the second cycle to confirm the data obtained from the last scheduled sampling event (the 126th day). VOCs and SVOCs were analyzed by gas chromatography/mass spectrophotometry in accordance with SW-846 methods 8260 and 8270, respectively.

The actual time line for the sampling was as follows:

Event	Event Cycle	Sample Date	Required Analyses
Install two new GAC drums	Day 0	08/04/97	None
Check System	Day 9	08/13/97	VOC, SVOC,TB*
Check System	Day 35	09/08/97	VOC, SVOC
Check System	Day 65	10/08/97	VOC, SVOC
Start second cycle	Day 65	10/08/97	None
Check System	Day 72	10/15/97	VOC, SVOC
Check System	Day 98	11/10/97	VOC, SVOC
Check System	Day 126	12/08/97	VOC, SVOC
Verify previous data	N/A	01/15/98	VOC. SVOC

*Trip Blank for VOC

Data Presentation

The results of the sampling are presented in the four following figures. The figures present only the analytes detected by EPA Methods 8260 and 8270. In addition, exceedances of RFCA Action Levels (stream standards-based ARARs) are highlighted and the total mass of contaminants over the five month evaluation period is summed.

Three types of additional data are presented in Appendix 1, 2 and 3. Appendix 1 includes both the samples taken as part of the evaluation (ie. 8/13/97 - 1/15/98), and other recent samples in the RFETS Soil and Water Database that are relevant to the evaluation. In addition, the data in Appendix 1 includes all tentatively identified compounds detected during the evaluation.

Appendix 2 contains original data tables from the *Modified Proposed Action Memorandum Passive Seep Interception and Treatment Operable Unit 7, Revision 1,* March 1996. These original data tables represent untreated water samples taken from the seep and have been included for comparison to the new seep data collected for the

Figure 1
OU7 SW00396 Landfill Treatment System Influent

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98	Total Mass (g) 8/97 through 1/98	
1,1-Dichloroethane	1000	4.00	3.90	5.40	4.81		5.60	6.90	13.19	
1,2-Dichlorobenzene	620			0.44			0.47	0.54	0.61	
1,4-Dichlorobenzene	75			0.56			0.66	0.65	0.79	
Acetone					8.47				2.29	
Benzene	1	**1.20**	**1.10**	**1.50**			**1.70**	**2.10**	3.52	
Chlorobenzene	100			0.29				0.54	0.33	
Chloroethane		13.00	12.00	15.00		15.00	18.00	16.00	42.05	
cis-1,2-Dichloroethene	70						0.42	0.52	0.46	
Ethylbenzene	680	6.20	6.30	9.70	8.32	12.00	9.40	12.00	28.25	
Napthalene	620	13.00	12.00	30.00	22.90	16.00	37.00	41.00	74.26	
Toluene	1000			1.30	1.35		1.40	1.10	1.95	
Trichloroethene	2.7			0.55			0.70	0.91	0.93	
Vinyl chloride	2	1.70		**2.20**	1.84		**2.50**		3.28	
Xylene (total)	10000	13.00	14.00	3.00	1.47	3.60	3.20	2.80	20.79	
									Total Volatiles	192.72
SemiVolatiles										
Acenaphthene	520	1.10		2.10			4.00	4.90	5.51	
bis (2-Ethylhexyl)Phthalate	10		1.60				3.00	1.30	3.03	
Butylbenzylphthalate	300									
Di-n-Butylphthalate	10									
Diethylphthalate	23000									
Ethylbenzene	680			5.90					1.60	
Fluorene	1300			1.80			2.80	3.00	3.33	
Naphthalene	620	1.80	1.30	12.00	6.28		16.00		14.75	
Phenanthrene	10			2.80			4.20	4.00	4.78	
Phenol	2560									
									Total SemiVolatiles	32.98
Average Monthly Flow (gal/min)		3.20	3.40	3.20	3.20	3.10	3.00	2.80		
Average Monthly Flow (l/min)		12.11	12.87	12.11	12.11	11.73	11.36	10.60		

NOTE: ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED
NOTE: RFCA ACTION LEVEL EXCEEDANCES ARE SHADED
NOTE: NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

Figure 2

OU7 SW00296 Landfill Treatment Lead GAC Effluent

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	GAC CHANGE	15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98
1,1-Dichloroethane	1000		2.70	4.40		2.99	5.00	6.80	7.70
1,2-Dichlorobenzene	620							0.46	
1,4-Dichlorobenzene	75							0.60	
Acetone						6.25			
Benzene	1			0.59				**1.90**	**1.10**
Chlorobenzene	100								
Chloroethane		4.40	9.60	16.00			17.00	18.00	19.00
cis-1,2-Dichloroethene	70							0.50	0.38
Ethylbenzene	680			1.40				11.00	3.70
Napthalene	620		1.40	1.00				36.00	1.10
Toluene	1000			0.23				1.50	0.58
Trichloroethene	2.7							0.87	0.43
Vinyl chloride	2			**2.20**				**2.80**	**3.00**
Xylene (total)	10000			1.20				3.70	0.76
SemiVolatiles									
Acenaphthene	520							4.10	
bis (2-Ethylhexyl)Phthalate	10							3.70	
Butylbenzylphthalate	300								
Di-n-Butylphthalate	10								
Diethylphthalate	23000								
Ethylbenzene	680								
Fluorene	1300								
Naphthalene	620							19.00	
Phenanthrene	10							4.60	
Phenol	2560								
Average Monthly Flow (gal/min)		3.20	3.40	3.20		3.20	3.10	3.00	2.80
Average Monthly Flow (l/min)		12.11	12.87	12.11		12.11	11.73	11.36	10.60

NOTE: ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED

NOTE: RFCA ACTION LEVEL EXCEEDANCES ARE SHADED

NOTE: NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

Figure 3

OU7 SW00196 Landfill Treatment System Effluent

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	GAC CHANGE	15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98	Total Mass (g) 8/97 through 1/98	
1,1-Dichloroethane	1000			2.00				3.50	5.60	4.96	
1,2-Dichlorobenzene	620									0.00	
1,4-Dichlorobenzene	75									0.00	
Acetone						5.76				1.56	
Benzene	1									0.00	
Chlorobenzene	100									0.00	
Chloroethane			11.00	16.00				18.00	17.00	27.61	
cis-1,2-Dichloroethene	70									0.00	
Ethylbenzene	680									0.00	
Napthalene	620			14.00						3.78	
Toluene	1000									0.00	
Trichloroethene	2.7									0.00	
Vinyl chloride	2			**2.40**				**2.80**		2.07	
Xylene (total)	10000									0.00	
										Total Volatiles	39.98
SemiVolatiles											
Acenaphthene	520									0.00	
bis (2-Ethylhexyl)Phthalate	10							3.70		1.88	
Butylbenzylphthalate	300									0.00	
Di-n-Butylphthalate	10		1.40						3.20	2.29	
Diethylphthalate	23000									0.00	
Ethylbenzene	680									0.00	
Fluorene	1300									0.00	
Naphthalene	620									0.00	
Phenanthrene	10									0.00	
Phenol	2560									0.00	
										Total SemiVolatiles	4.17
Average Monthly Flow (gal/min)		3.20	3.40	3.20		3.20	3.10	3.00	2.80		
Average Monthly Flow (l/min)		12.11	12.87	12.11		12.11	11.73	11.36	10.60		

NOTE: ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED

NOTE: RFCA ACTION LEVEL EXCEEDANCES ARE SHADED

NOTE: NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

Figure 4
OU7 SW098 Landfill Pond

Volatiles (ug/L)	RFCA Action Level	Concentration 13-Aug-97	8-Sep-97	8-Oct-97	GAC CHANGE	15-Oct-97	10-Nov-97	8-Dec-97	15-Jan-98
1,1-Dichloroethane	1000								
1,2-Dichlorobenzene	620								
1,4-Dichlorobenzene	75								
Acetone									
Benzene	1								
Chlorobenzene	100								
Chloroethane									
cis-1,2-Dichloroethene	70								
Ethylbenzene	680								
Napthalene	620			1.50			1.50		
Toluene	1000								
Trichloroethene	2.7								
Vinyl chloride	2								
Xylene (total)	10000								
SemiVolatiles									
Acenaphthene	520								
bis (2-Ethylhexyl)Phthalate	10								
Butylbenzylphthalate	300								
Di-n-Butylphthalate	10								
Diethylphthalate	23000								
Ethylbenzene	680								
Fluorene	1300								
Naphthalene	620								
Phenanthrene	10								
Phenol	2560								
Average Monthly Flow (gal/min)		3.20	3.40	3.20		3.20	3.10	3.00	2.80
Average Monthly Flow (l/min)		12.11	12.87	12.11		12.11	11.73	11.36	10.60

NOTE: ONLY ANALYTES DETECTED BY EPA METHODS 8260 AND 8270 WHICH HAVE RFCA LEVELS ARE LISTED

NOTE: RFCA ACTION LEVEL EXCEEDANCES ARE SHADED

NOTE: NO VALUES SHOWN INDICATE BELOW DETECTION LIMIT

evaluation. The original seep data collected for the March 1996 PAM are consistent with the new seep data collected during the evaluation - in terms of both the constituents identified and the overall concentrations.

Appendix 3 contains original data tables from the Draft Phase 1 IM/IRA *Decision Document and Closure Plan for Operable Unit 7 Present Landfill,* March 1996. These original data tables represent pond water samples and have been included for comparison to the new pond water data collected for the evaluation. The original pond water data collected for the March 1996 IM/IRA are consistent with the new pond water data collected during the evaluation - in terms of both the constituents identified and the overall concentrations.

Discussion of Results

Influent Quality

Two VOC constituents are present in the influent at concentrations slightly above the stream standards-based ARARs. The mass of contamination above stream standards, on a yearly basis, is less than 10 grams. It should also be noted that none of the other VOC or SVOC constituents detected approached the ARAR values. (See Figure 1).

Although not a focus of the investigation, it is important to recognize that the maximum metal concentrations detected in the seep (see Appendix 2) are consistent with the reported background values for seeps at RFETS. (See Appendix 4).

Carbon Changeout Frequency

Figure 2 shows that vinyl chloride and benzene break through the lead GAC at four to eight weeks. In fact, at eight weeks, vinyl chloride had broken through both the lead and the polish GAC units and was present in the effluent at levels exceeding ARARs. (See Figure 3). To be confident that ARARs are attained, carbon changeout should be conducted monthly.

This conclusion is supported in the literature. The chart in Appendix 5 illustrates the relative effectiveness of different treatment technologies for specific organic constituents. Both benzene and vinyl chloride appear in the upper right hand corner of the chart and are considered "poor adsorber but good stripper".

Landfill Pond Water Quality

Figure 4 is consistent with the results tabulated in Appendix 3. Only very limited contamination has been detected. None of the VOC or SVOC constituents approach the stream standards-based ARARs.

Appendix 1

Recent Passive Seep Interception Treatment System Data in RFETS Soil and Water Database

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
(1-methyl-1-propenyl)-(E)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	3.4	ND	ND	ND	ND
1,1-Dichloroethane	ND	9	ND	NT	ND	1	NT	NT	4.2	4	3.9	5.4	4.81	5.6	3.5	5.6
1,1-Dichloroethene	2	ND	ND	NT	ND	1.7	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-tetrahydro-1-methylnaphthalen	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.6	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	0.95	ND	1.8	1.93	2.2	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.44	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.31	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.56	ND	ND	ND	ND
1-ethly-2,3-dimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.8	ND	ND	ND	ND
1-Ethyle-2-methylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
1-Methyl-3-(1-methyethyl)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
1-Methylethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1	ND	ND	ND	ND
2,3-dihydro-1,2-dimethyl-1H-Indene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	4.5	ND	ND	ND	ND
2,3-Dihydroindene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	2.2	ND	ND	ND	ND
2-butanone	4	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-ethenyl-1,3,4-trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
4-isopropyltolune	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.65	ND	ND	ND	ND
4-Methylethylbenzene 2-oxethanone	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
Acetone	22	ND	ND	NT	ND	0.67	NT	NT	ND	ND	ND	ND	8.47	ND	ND	ND
Benzene	0.3	ND	ND	NT	ND	ND	NT	NT	0.33	1.2	1.1	1.5	ND	1.8	ND	ND
Chlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.29	ND	ND	ND	ND
Chlorodiflouromethane	41	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	23	23	NT	20	4.7	NT	NT	19	13	12	2.2	ND	15	18	17
Chloroflouromethane	25	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	31	ND	ND
Dichlorodifluoromethane	ND	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorofluoromethane	9	ND	ND	NT	ND	ND	NT	NT	ND	1.5	ND	ND	1.48	ND	5.78	8.4
Dichlorofluoromethane	ND	ND	ND	NT	ND	ND	NT	NT	ND	3.8	9.1	11	ND	7.2	ND	ND
Ethylbenzene	0.2	2	ND	NT	ND	ND	NT	NT	0.58	6.2	6.3	9.7	8.32	12	ND	ND
Hexane	0.7	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	1.4	ND	ND
Methylene Chloride	2	1	ND	NT	0.8	ND	NT	NT	0.45	ND	ND	ND	3.31	ND	ND	ND
n-Butylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.27	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.31	ND	ND	ND	ND
Napththalene	ND	ND	ND	NT	ND	ND	NT	NT	ND	13	12	30	22.9	16	ND	ND
Toluene	0.2	ND	ND	NT	0.9	ND	NT	NT	ND	ND	ND	1.3	1.35	1.3	ND	ND
Trichloroethene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.55	ND	ND	ND	ND
Vinyl Chloride	ND	5	2	NT	2	ND	NT	NT	ND	1.7	ND	1.84	1.84	ND	2.8	ND
Xylene (Total)	2	ND	ND	NT	ND	0.25	NT	NT	ND	13	14	3	1.47	3.6	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1-Methylnaphthalene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2(3H)-Benzothalazone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Imidazolidinedione,1-(hydrox	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.9	ND	ND
2-bitoxyethanol	66	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-Fluoro-1-propene	ND	NT	NT	NT	ND	ND	NT	NT	ND	6.6	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyloxy-3-methybutane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-Proenoicacid,2-methyl-ethylene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	5.9	ND	ND	ND	ND
3,3-dimethyl-1-Butene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	8.6	ND	ND	ND	ND
3-phenyl-5(4H)-isoxalone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4,4-(1-methylethylidene)bisphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4,4-(Methylethylidene)Biphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4-isothiazolecarboxamide	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Alpha,alpha 4-trimethycyclohexane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzocycloheptatriene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzoicacid	28	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexy)Phthalate	5	NT	NT	NT	ND	4.9	NT	NT	ND	ND	ND	ND	ND	ND	3.7	ND
Butylbenzophthalate	4	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-buthylphthalate	6	NT	NT	NT	ND	ND	NT	NT	ND	ND	1.4	ND	ND	ND	ND	3.2
Dibenzofuran	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	3	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Hydroxy MethylesterAcetic acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Napthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	5	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethyleste phosphoric Acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethylphosphate	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

SW00196 Treatment System Effluent

Sampling History at OU7
Location SW00196 Landfill Treatment System Effluent

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
(1-methyl-1-propenyl)-(E)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	3.4	ND	ND	ND	ND
1,1-Dichloroethane	ND	9	ND	NT	ND	1	NT	NT	4.2	4	3.9	5.4	4.81	5.6	3.5	5.6
1,1-Dichloroethene	2	ND	ND	NT	ND	1.7	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4-tetrahydro-1-methylnaphthalen	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.6	ND	ND	ND	ND
1,2,4-Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	0.95	ND	1.8	1.93	2.2	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.44	ND	ND	ND	ND
1,3,5-Trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.31	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.56	ND	ND	ND	ND
1-ethly-2,3-dimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.8	ND	ND	ND	ND
1-Ethyle-2-methylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
1-Methyl-3-(1-methyethyl)benzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
1-Methylethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1	ND	ND	ND	ND
2,3-dihydro-1,2-dimethyl-1H-Indene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	4.5	ND	ND	ND	ND
2,3-Dihydroindene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	2.2	ND	ND	ND	ND
2-butanone	4	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-ethenyl-1,3,4-trimethylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
4-isopropyltolune	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.65	ND	ND	ND	ND
4-Methylethylbenzene 2-oxethanone	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	ND	ND	ND
Acetone	22	ND	ND	NT	ND	0.67	NT	NT	ND	ND	ND	ND	8.47	ND	ND	ND
Benzene	0.3	ND	ND	NT	ND	ND	NT	NT	0.33	1.2	1.1	1.5	ND	1.8	ND	ND
Chlorobenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.29	ND	ND	ND	ND
Chlorodiflouromethane	41	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	23	23	NT	20	4.7	NT	NT	19	13	12	2.2	ND	15	18	17
Chloroflouromethane	25	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	31	ND	ND
Dichlorodifluoromethane	ND	2	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorofluoromethane	9	ND	ND	NT	ND	ND	NT	NT	ND	1.5	ND	ND	1.48	ND	5.78	8.4
Dichlorofluoromethane	ND	ND	ND	NT	ND	ND	NT	NT	ND	3.8	9.1	11	ND	7.2	ND	ND
Ethylbenzene	0.2	2	ND	NT	ND	ND	NT	NT	0.58	6.2	6.3	9.7	8.32	12	ND	ND
Hexane	0.7	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	1.1	ND	1.4	ND	ND
Methylene Chloride	2	1	ND	NT	0.8	ND	NT	NT	0.45	ND	ND	ND	3.31	ND	ND	ND
n-Butylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.27	ND	ND	ND	ND
n-Propylbenzene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.31	ND	ND	ND	ND
Napththalene	ND	ND	ND	NT	ND	ND	NT	NT	ND	13	12	30	22.9	16	ND	ND
Toluene	0.2	ND	ND	NT	0.9	ND	NT	NT	ND	ND	ND	1.3	1.35	1.3	ND	ND
Trichloroethene	ND	ND	ND	NT	ND	ND	NT	NT	ND	ND	ND	0.55	ND	ND	ND	ND
Vinyl Chloride	ND	5	2	NT	2	ND	NT	NT	ND	1.7	ND	1.84	1.84	ND	2.8	ND
Xylene (Total)	2	ND	ND	NT	ND	0.25	NT	NT	ND	13	14	3	1.47	3.6	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

SW00196 Treatment System Effluent

Sampling History at OU7

Location SW00196 Landfill Treatment System Effluent

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	11/20/97	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1-Methylnaphthalene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2(3H)-Benzothalazone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Imidazolidinedione,1-(hydrox	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.9	ND	ND
2-bitoxyethanol	66	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-Fluoro-1-propene	ND	NT	NT	NT	ND	ND	NT	NT	ND	6.6	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyloxy-3-methybutane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
2-Proenoicacid,2-methyl-ethylene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	5.9	ND	ND	ND	ND
3,3-dimethyl-1-Butene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	8.6	ND	ND	ND	ND
3-phenyl-5(4H)-isoxalone	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4,4-(1-methylethylidene)bisphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4,4-(Methylethylidene)Biphenol	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
4-isothiazolecarboxamide	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Alpha,alpha 4-trimethycyclohexane	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzocycloheptatriene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Benzoicacid	28	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexy)Phthalate	5	NT	NT	NT	ND	4.9	NT	NT	ND	ND	ND	ND	ND	ND	3.7	ND
Butylbenzophthalate	4	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-buthylphthalate	6	NT	NT	NT	ND	ND	NT	NT	ND	ND	1.4	ND	ND	ND	ND	3.2
Dibenzofuran	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	3	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Hydroxy MethylesterAcetic acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Napthalene	2	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	5	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethyleste phosphoric Acid	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND
Triethylphosphate	ND	NT	NT	NT	ND	ND	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND

ND=Sample Below Detection Limit
NT=Not Sampled

Sampling History at OU7
Location SW00296 Landfill Treatment Lead GAC Effluent

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	11/20/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1,1-Dichloroethane	NT	NT	5	6	5	5.5	5	4	NT	ND	2.7	4.4	2.99	5	6.8	7.7
1,2,4-Trimethylbenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	2.2	ND
1,2-Dichlorobenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0.48	ND
1,4-Dichlorobenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0.6	ND
2-Butanone	NT	NT	ND	4	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND
Acetone	NT	NT	ND	5	ND	1.8	ND	ND	NT	ND	ND	ND	6.25	ND	ND	ND
Benzene	NT	NT	ND	ND	0.8	0.24	ND	ND	NT	ND	ND	0.59	ND	ND	1.9	1.1
Carbon disulfide	NT	NT	ND	ND	ND	0.2	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NT	NT	22	25	21	24	30	36	NT	4.4	9.6	16	ND	17	18	19
Chloroflouromethane	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	32	ND	ND
cis 1,2-Dichloroethene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0.5	0.38
Dichlorofluoromethane	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	6.5	ND	ND	7.8	4.49	7.3
Ethylbenzene	NT	NT	ND	5	3	0.69	ND	ND	NT	ND	ND	ND	ND	ND	11	3.7
Isopropylbenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	1.2	0.32
Methylene Chloride	NT	NT	ND	1	0.7	1.1	ND	ND	NT	ND	ND	ND	1.69	ND	0.38	ND
n-Propylbenzene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0.71	ND
Napththalene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	1.4	1	ND	ND	36	1.1
Toluene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	0.23	ND	ND	1.5	0.58
Trichloroethene	NT	NT	ND	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	0.87	0.43
Vinyl Chloride	NT	NT	3	3	2	3.2	2	3	NT	ND	ND	2.2	2.8	ND	ND	3
Xylene (Total)	NT	NT	ND	2	ND	ND	ND	ND	NT	ND	ND	1.2	ND	ND	3.7	0.76

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	11/20/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1,8 Naphtalic anhydride	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	4.9	ND	ND
2-Methylnaphthalene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	2.7	ND
Acenaphthene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	4.1	ND
Alpha,alpha cyclohexanemethanol	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	4.2	ND	ND
bis(2-Ethylhexy)Phthalate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	3.7	ND
Butyl glycolate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	5.9	ND	ND	ND	ND
Fluorene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	3	ND
Napthalene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	ND	19	ND
Phenanthrene	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	4.5	ND	ND	ND	ND
Triethyl esterphosphoric acid	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	5.8	ND	ND	ND	ND
Triethylphosphate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	ND	ND	7.4	ND	ND
Di-n-butyl phthalate	NT	NT	ND	ND	NT	ND	ND	ND	NT	ND	ND	6.2	ND	ND	ND	2.5

ND=Sample Below Detection Limit
NT=Not Sampled

SW098 Landfill Pond

Sampling History at OU7
Location SW098 Landfill Pond

Volatile Organics	5/29/96	7/16/96	9/13/96	10/30/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
1,2-Dichloropropane	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	0.48	ND	ND
Acetone	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	3.9	4	ND
Methylene Chloride	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	ND	1	ND
Napththalene	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	1.5	ND	1.5	ND	ND

SemiVolatiles	5/29/96	7/16/96	9/13/96	10/30/96	1/20/97	2/19/97	4/23/97	6/16/97	8/13/97	9/8/97	10/8/97	10/15/97	11/10/97	12/8/97	1/15/98
bis(2-Ethylhexy)Phthalate	NT	NT	NT	NT	NT	NT	NT	NT	ND	ND	ND	ND	1.1	4	ND

ND=Sample Below Detection Limit
NT=Not Sampled

Appendix 2

Seep Data from the Modified Proposed Action Memorandum Passive Seep Interception and Treatment Operable Unit 7, March 1996

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
METALS[1]									
ALUMINUM	0.4 - 30000	16/19	29	28900	BLANK	BLANK	2629	87	µG/L
ANTIMONY	0.05 - 60	4/18	14	60.4	BLANK	A	20	300	µG/L
ARSENIC	0.7 - 10	8/16	1.4	3	B	BLANK	3	5	µG/L
BARIUM	0.02 - 50000	19/19	297	1550	BLANK	BLANK	645	1000	µG/L
BERYLLIUM	0.2 - 5	2/18	0.2	1.4	BLANK	JA	1	4	µG/L
CADMIUM	0.1 - 16.5	4/18	1	7.6	BLANK	BLANK	3	TVS (1.5)	µG/L
CHROMIUM	2.4 - 27.5	7/18	2	29.6	BLANK	BLANK	9	50	µG/L
COBALT	0.02 - 50	10/18	2.7	19.1	B	BLANK	11	50	µG/L
COPPER	2.4 - 25	8/18	2	94.9	BLANK	BLANK	12	TVS (16)	µG/L
LEAD	0.8 - 2000	14/18	1.5	11	BLANK	V	5	TVS (6.46)	µG/L
IRON	4.7 - 430,000	19/19	61300	155000	BLANK	V	81005	1000	µG/L
LITHIUM	2 - 2000	15/19	34	107	BLANK	V	48	2500	µG/L
MANGANESE	1 - 10000	19/19	1320	2490	BLANK	BLANK	1623	50	µG/L
MERCURY	0.02 - 0.2	1/18	0.1	0.28	BLANK	BLANK	0.1	10	µG/L
MOLYBDENUM	5.7 - 200	6/18	4	28.5	B	BLANK	21		µG/L
NICKEL	0.02 - 40	5/18	5	31	BLANK	V	12	125	µG/L
SELENIUM	1.1 - 5	2/18	1.1	7	W	BLANK	2	17	µG/L
SILVER	2.6 - 25	8/18	2.7	16.7	BLANK	BLANK	5	50	µG/L
STRONTIUM	3.5 - 10000	17/19	814	1370	BLANK	BLANK	920		µG/L
TIN	10 - 200	8/18	11	243	BLANK	BLANK	48	8000	µG/L
VANADIUM	3.2 - 10000	12/19	3.1	211	BLANK	BLANK	25	100	µG/L
ZINC	1.8 - 10000	19/19	857	18000	BLANK	BLANK	2974	2000	µG/L
PESTICIDES									
alpha-BHC	0.05 - 0.28	1/3	0	0	I	BLANK	0.06		µG/L
RADIONUCLIDES									
AMERICIUM-241	0 - 0.013	16/16	-0.000404	0.02121	BLANK	V	0.007	30	pCi/L
CESIUM-137	0.47 - 1	14/14	-0.21	0.6057	J	BLANK	0.15	3000	pCi/L
PLUTONIUM-238	0.01 - 0.01	2/2	-0.000465	0.00222	J	A	0.00088	30	pCi/L
PLUTONIUM-239	0.003 - 0.003	1/1	0.009	0.009	BLANK	BLANK	0.009	30	pCi/L
PLUTONIUM-239/240	0 - 0.013	16/16	0.001	0.01606	BLANK	A	0.007	30	pCi/L
RADIUM-226	0.03 - 0.03	1/1	0.58	0.58	BLANK	A	0.58	100	pCi/L
STRONTIUM-89,90	0.21 - 1	9/9	0.66	4.06	BLANK	V	1.35	60	pCi/L
STRONTIUM-90	0.2 - 0.59	3/3	0.5442	1.1	BLANK	BLANK	0.7		pCi/L
TRITIUM	155 - 450	19/19	185.4	1500	BLANK	A	393	1000	pCi/L
URANIUM-233,-234	0.1 - 0.6	12/12	-0.0238	4.2	B	A	0.8	500	pCi/L
URANIUM-235	0 - 0.6	12/12	-0.012	0.084	J	A	0.03	600	pCi/L
URANIUM-238	0.086 - 0.6	12/12	0.03914	3.76	BLANK	A	1	600	pCi/L
SEMIVOLATILE ORGANICS									
2,4-DIMETHYLPHENOL	10 - 10	1/5	3	3	J	A	5	36	µG/L

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
2-METHYLNAPHTHALENE	10 - 10	5/5	12	23	BLANK	V	16	2	µG/L
4-METHYLPHENOL	10 - 10	3/5	2	4	J	BLANK	4	2	µG/L
ACENAPHTHENE	10 - 10	5/5	2	3	J	A	3	520	µG/L
BIS(2-ETHYLHEXYL)PHTHALATE	10 - 12	1/5	2	2	J	A	5	10	µG/L
DIBENZOFURAN	10 - 10	5/5	1	2	J	A	1	2	µG/L
DIETHYL PHTHALATE	10 - 10	4/5	1	3	J	A	3	200	µG/L
FLUORENE	10 - 10	5/5	2	3	J	A	2	10	µG/L
NAPHTHALENE	10 - 10	5/5	14	22	BLANK	V	18	10	µG/L
PHENANTHRENE	10 - 10	5/5	4	5	J	A	4	10	µG/L
VOLATILE ORGANICS									
1,1-DICHLOROETHANE	5 - 5	17/20	2	10	BLANK	V	6	59	µG/L
1,2-DICHLOROETHENE	5 - 5	10/20	2	14	BLANK	V	4	70	µG/L
2-BUTANONE	10 - 10	6/19	6	76	BLANK	V	12	280	µG/L
2-HEXANONE	10 - 10	1/20	1	10	BLANK	V	5	50	µG/L
4-METHYL-2-PENTANONE	10 - 10	5/20	10	87	J	A	11	140	µG/L
ACETONE	10 - 10	10/20	10	220	BLANK	A	34	280	µG/L
BENZENE	5 - 5	1/20	1	2	J	BLANK	2	1	µG/L
CARBON DISULFIDE	5 - 5	1/20	5	6	BLANK	BLANK	3		µG/L
CHLOROETHANE	10 - 10	15/20	10	57	BLANK	V	22	190	µG/L
CHLOROMETHANE	10 - 10	2/20	4	7	J	A	5	5.7	µG/L
ETHYLBENZENE	5 - 5	19/20	1	18	BLANK	BLANK	13	57	µG/L
METHYLENE CHLORIDE	5 - 5	9/20	3	190	B	BLANK	14	5.7	µG/L
o-XYLENE	5 - 5	3/4	5	8	BLANK	BLANK	6		µG/L
TETRACHLOROETHENE	5 - 5	2/20	1	[illegible]	J	BLANK	2	[illegible]	µG/L
TOLUENE	5 - 5	19/20	5	88	BLANK	BLANK	38	1000	µG/L
TOTAL XYLENES	5 - 5	19/20	1	25	J	A	14	10000	µG/L
TRICHLOROETHENE	5 - 5	11/20	1	4	J	BLANK	2	2.7	µG/L
VINYL ACETATE	10 - 10	1/19	10	49	BLANK	BLANK	7	[illegible]	µG/L
VINYL CHLORIDE	10 - 10	5/20	3	[illegible]	BLANK	V	5	2	µG/L
WATER QUALITY PARAMETERS									
BICARBONATE AS CACO3	1000 - 10000	15/15	554000	705000	BLANK	V	595800		µG/L
CARBONATE AS CACO3	1000 - 10000	2/9	0	0	BLANK	BLANK	3889		µG/L
CHLORIDE	100.0 - 50000	14/14	1800	66300	BLANK	V	53650		µG/L
CYANIDE	10 - 20	1/14	1.5	36.8	BLANK	BLANK	9	200	µG/L
DISSOLVED ORGANIC CARBON	1000 - 1000	4/4	14000	27000	BLANK	JA	18750		µG/L
FLUORIDE	100.0 - 200.0	12/12	390.0	540.0	BLANK	V	469.2	2000	µG/L
NITRATE/NITRITE	20.00 - 200.0	6/10	20.00	870.0	BLANK	V	263	10000	µG/L
NITRITE	20.00 - 20.00	6/9	20.00	63.00	BLANK	V	30.33	500	µG/L
OIL AND GREASE	200.0 - 11100.0	4/12	800.0	42100	BLANK	V	7013		µG/L
ORTHOPHOSPHATE	10.00 - 200.0	3/10	50.00	150.0	BLANK	BLANK	60.9		µG/L
pH		5/5	6.8	7.3	BLANK	BLANK	7		PH

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean Result	ARAR/TBC	Units
PHOSPHORUS	50.00 - 1000	9/9	95.00	1380	BLANK	BLANK	387		µG/L
SILICA	400.0 - 2000	3/3	7400	43000	BLANK	BLANK	19567		µG/L
SILICON	7.3 - 2000	13/13	7060	44000	BLANK	BLANK	13547		µG/L
SOLIDS, NONVOLATILE SUSPENDE	5000 - 5000	6/6	10000	199000	BLANK	BLANK	83167		µG/L
SULFATE	200.0 - 25000	5/14	200.0	29600	BLANK	V	5084	250000	µG/L
TOTAL DISSOLVED SOLIDS	10000 - 10000	15/15	470000	870000	BLANK	BLANK	729333		µG/L
TOTAL ORGANIC CARBON	1000 - 1000	3/3	19000	24500	BLANK	V	20833		µG/L
TOTAL SUSPENDED SOLIDS	4000 - 5000	12/12	10000	250000	BLANK	BLANK	144667		µG/L

Shaded analytes indicate mean result exceeds ARAR.
All analytes are total analytes unless otherwise noted.
Analytes with zero detections are not reported.
For non-detects, one-half the detection limit is used in calculating the mean result.
[1] Total recoverable concentration reported.
[2] Not listed in 40 CFR 302.4 or 6 CCR 1007-3, Part 261 - Appendix VII and therefore are not required to be addressed under a CERCLA Remedial Action.
[3] For tetrachloroethene, the maximum detection equals the ARAR; the mean exceeds the ARAR because one-half detection limit for non-detects exceeds the ARAR.
[4] For vinyl acetate, one detection out of nineteen causes mean to exceed ARAR; suggests that one detection is outlier and should be discarded.

Data Qualifiers
BLANK = data qualifier field in database is blank.
B = for inorganics, reported value is < CRDL but > IDL (estimated value).
B = for organics, analyte is also detected in blank;
for common lab contaminants include as detection if blank result > 10 times detection limit;
for all other organics include if blank result > 5 times detection limit.
B = for radionuclides, constituent also detected in blank whose concentration was > minimum detectable activity.
I = organics, interference with target peak (estimated value)
J = for organics, MS data indicate presence of compound but below detection limit (estimated value).
U = for inorganics and organics, analyte analyzed but not detected at the quantitation limit.

Data Validation Codes
BLANK = data validation field in database is blank.
A = acceptable result.
JA = acceptable result (for estimated value).
V = valid result.
TVS = table value standard, hardness dependent, 5 CCR 1002-8

Appendix 3

Landfill Pond Data from the *Draft Phase 1 IM/IRA Decision Document and Closure Plan for Operable Unit 7, Present Landfill,* March 1996

Table 2-3
Analytes Detected in Surface Water in the East Landfill Pond (SW098)

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean	Background (UTL[illegible]) Concentration	Units	PCOC
Metals										
Aluminum	20 - 200	10/15	30	190	—	V	56	39,000	µg/L	
Arsenic	0.7 - 10	5/14	0.9	2.2	—	V	1	3,500	µg/L	
Barium	1.3 - 200	15/15	16	250	—	V	170	64,000	µg/L	2
Beryllium	0.5 - 5	1/15	0.5	0.7	—	JA	1	1,700	µg/L	
Cadmium	2.4 - 5	1/15	1	2.1	—	JA	2	1,800	µg/L	
Calcium	14.3 - 5,000	15/15	3,200	55,000	—	V	39,000	57,000	µg/L	2,3
Cesium	100 - 1,000	1/16	33	50	—	V	180	480,000	µg/L	
Chromium	2.4 - 10	1/15	2	3.2	—	JA	3	3,300	µg/L	
Copper	2.1 - 25	4/15	2	16	—	JA	4	8,300	µg/L	
Iron	4.3 - 100	15/15	16	1,200	—	V	490	17,000	µg/L	
Lead	0.8 - 3	5/14	0.9	5.3	—	JA	2	1,500	µg/L	
Lithium	2 - 100	14/14	7.7	110	—	—	77	36,000	µg/L	2
Magnesium	30 - 5,000	15/15	4,300	45,800	—	V	37,000	1,200,000	µg/L	2,3
Manganese	1 - 15	14/15	2.5	430	—	V	100	3,000	µg/L	2
Mercury	0.2	2/15	0.2	0.54	—	V	0.1	59	µg/L	
Molybdenum	5.7 - 200	1/14	3	13	B	—	6	33,000	µg/L	2
Nickel	3.9 - 40	8/15	6.3	17	—	V	8	13,000	µg/L	2
Potassium	95 - 5,000	15/15	1,400	11,000	—	V	8,400	1,600,000	µg/L	2,3
Silver	2.5 - 10	1/15	2	2.9	—	V	2	3,000	µg/L	
Sodium	21 - 5,000	15/15	20,000	190,000	—	V	160,000	39,000	µg/L	1,2,3
Strontium	2.3 - 200	14/14	45	600	—	V	460	240,000	µg/L	2
Thallium	1.2 - 10	1/14	1	7.4	—	JA	1	6,500	µg/L	
Tin	10 - 200	3/14	10	26	B	—	12	34,000	µg/L	
Vanadium	2 - 50	1/15	2	5.6	B	—	2	17,000	µg/L	

Table 2-3
Analytes Detected in Surface Water in the East Landfill Pond (SW098)

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean	Background UTL and Concentration	Units	PCOC
Zinc	1.8 - 20	12/15	4	26	—	V	10	3,700	µg/L	
Radionuclides										
Americium-241	0 - 0.19	11/11	0.00057	0.031	U	A	0.007	0.03	pCi/L	1
Cesium-137	0.58 - 1.2	6/6	-0.17	-0.044	J	A	-0.11	2.1	pCi/L	
Gross alpha	2 - 8.7	6/6	-0.67	5	U	V	1	29	pCi/L	2,6
Gross beta	2.6 - 6.8	6/6	7.9	16	—	V	11	31	pCi/L	2,6
Plutonium-239	0.14 - 0.03	3/3	0	0.005	U	A	0.002	—	pCi/L	
Plutonium-239/240	0 - 0.01	9/9	-0.00036	0.023	—	A	0.004	0.03	pCi/L	
Radium-226	0.21	1/1	0.23	0.23	—	V	0.23	17	pCi/L	
Strontium-89/90	0.23 - 1	5/5	0.66	1.9	—	A	1.4	4.9	pCi/L	2
Strontium-90	0.36 - 0.58	5/5	0.7084	1.208	—	V	1.02	—	pCi/L	
Tritium	160 - 460	13/13	86	260	J	V	160	730	pCi/L	2
Uranium-233/234	0 - 0.23	5/5	0.76	1.6	—	A	1.1	2.2	pCi/L	2
Uranium-235	0 - 0.26	5/5	0.036	0.3	—	A	0.2	0.3	pCi/L	1,2
Uranium-238	0.094 - 0.263	5/5	0.70	2	—	A	1.2	1.8	pCi/L	1,2
Semivolatile Organic Compounds										
Bis(2-ethylhexyl)phthalate	9 - 11	1/7	1	1	J	A	5	8	µg/L	4
Di-n-butyl phthalate	9 - 11	1/7	1	1	J	A	5	—	µg/L	4
Volatile Organic Compounds										
Methylene chloride	5	2/15	4	8	B	—	3	21	µg/L	4
Indicator Parameters										
Bicarbonate as $CaCO_3$	1,000 - 10,000	14/14	213,000	489,000	—	V	390,000	—	µg/L	
Carbonate	10,000	1/4	10,000	15,300	—	V	7,600	—	µg/L	
Carbonate as $CaCO_3$	1,000 - 10,000	7/10	10,000	77,000	—	V	33,000	—	µg/L	
Chloride	200 - 25,000	14/14	140,000	180,000	—	—	160,000	64,000	µg/L	1,2
Dissolved organic carbon	1,000 - 2,000	6/6	22,000	32,000	—	V	27,000	—	µg/L	

Table 2-3
Analytes Detected in Surface Water in the East Landfill Pond (SW098)

Analyte	Detection Limit Range	Detection Frequency	Minimum Result	Maximum Detection	Qualifier for Maximum Detection	Validation for Maximum Detection	Mean	Background UTL Concentration	Units	PCOC
Fluoride	100 - 200	13/13	590	890	—	—	770	—	µg/L	
Nitrate	100	1/3	100	200	—	JA	100	—	µg/L	
Nitrate/nitrite	20 - 100	6/11	40	320	—	JA	93	3,100	µg/L	
Oil and grease	200 - 7,100	1/10	500	500	—	—	2,500	—	µg/L	
Orthophosphate	10 - 50	1/10	40	40	—	—	27	—	µg/L	
pH	—	4/4	8.2	8.3	—	—	8.2	—	pH	
Phosphorus	50	2/9	50	76	—	V	35	—	µg/L	
Silica	400	1/1	3,100	3,100	—	—	3,100	—	µg/L	
Silicon	7.3 - 100	13/13	300	3,700	—	V	2,300	16,000	µg/L	
Solids, nonvolatile suspended	5,000	2/6	5,000	12,000	—	V	5,000	—	µg/L	
Sulfate	500 - 10,000	14/14	7,000	26,000	—	V	16,000	41,000	µg/L	
Total dissolved solids	10,000	14/14	570,000	810,000	—	V	730,000	—	µg/L	
Total organic carbon	1,000 - 2,000	6/6	26,000	51,000	—	—	34,000	—	µg/L	
Total suspended solids	4,000 - 5,000	1/9	4,000	12,000	—	—	3,500	—	µg/L	

Notes

All analytes are total analytes unless otherwise noted.
For non-detects, one-half the detection limit is used in calculating the mean result.

1 Analyte determined to be PCOC by hot measurement test.
2 Analyte determined to be PCOC by inferential statistics test(s).
3 Analyte not considered a PCOC because it is a nutrient or is not considered a contaminant.
4 All detected organic analytes are considered PCOCs unless eliminated by professional judgment.
5 Analyte not considered a PCOC because of infrequent detection and/or detection in blanks or background samples.
6 Analyte not considered a PCOC because it is not a measure of a single contaminant.
Analyte removed from consideration as PCOC.

Data Qualifiers

—	data qualifier or validation field in database is blank.
B	for inorganics, reported value is < CRDL but > IDL (estimated value).
B	for organics, analyte is also detected in blank; for common lab contaminants include as detection if blank result > 10 times detection limit; for all other organics include if blank result > 5 times detection limit.
J	for inorganics, value > IDL but control sample analysis not within control limits (estimated value).
J	for organics, data indicate presence of compound but below detection limit (estimated value).
U	for inorganics and organics, analyte analyzed but not detected at the quantitation limit.

Data Validation Codes

—	data qualifier field in database is blank.
A	acceptable result.
JA	acceptable result (for estimated value).
V	valid result.

Definitions

CRDL	contract-required detection limit
IDL	instrument detection limit
PCOC	potential contaminant of concern
$UTL_{99/99}$	upper tolerance limit of the 99th percentile at the 99-percent confidence level

Appendix 4

Seep/spring Water Background Concentrations for Metals from the *Background Geochemical Characterization Report,* September 1993

BACKGROUND GEOCHEMICAL CHARACTERIZATION REPORT

ROCKY FLATS PLANT
GOLDEN, COLORADO

September 30, 1993

Prepared for:
U.S. Department of Energy
Rocky Flats Plant
Golden, Colorado 80401

Prepared by:
EG&G Rocky Flats, Inc.
P.O. Box 464
Golden, Colorado 80402

Table C-23. Seep/spring water UTLs for total metals.

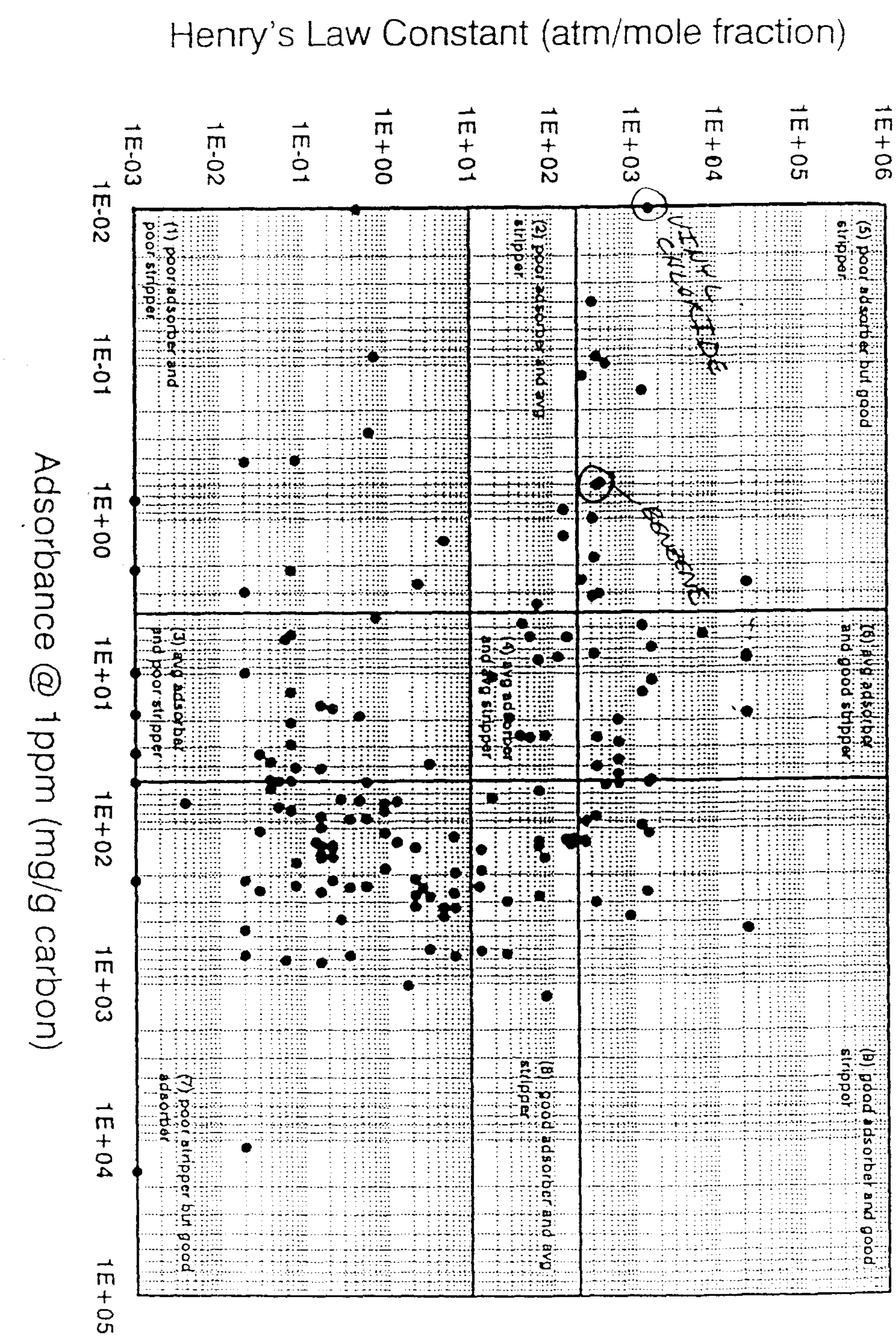
UPPER TOLERANCE LIMITS (SITE-WIDE)

SEEP / SPRING WATER, TOTAL METALS

ANALYTE	SAMPLE SIZE, N	PERCENT DETECTS	MEAN	STANDARD DEVIATION	99 / 99 UTL	UNITS
ALUMINUM	48	83.33	18,115.18	47,149.24	166,871.02	UG/L
ANTIMONY	34	32.35	46.68	108.89	411.91	UG/L
ARSENIC	44	59.09	69.77	192.06	675.73	UG/L
BARIUM	44	75.00	913.39	1,692.11	6,252.00	UG/L
BERYLLIUM	38	34.21	2.81	3.37	13.86	UG/L
CADMIUM	33	30.30	9.08	17.25	67.29	UG/L
CALCIUM	53	90.57	94,329.72	128,636.27	500,177.15	UG/L
CESIUM	33	24.24	419.98	449.37	1,936.79	UG/L
CHROMIUM	40	40.00	23.69	49.27	183.74	UG/L
COBALT	35	34.29	43.39	90.97	346.73	UG/L
COPPER	44	52.27	43.89	99.94	359.20	UG/L
CYANIDE	5	40.00	5.95	7.48	72.83	UG/L
IRON	51	88.24	175,074.71	518,671.63	1,811,483.71	UG/L
LEAD	45	66.67	91.14	207.26	745.05	UG/L
LITHIUM	35	48.57	29.43	26.57	118.02	UG/L
MAGNESIUM	50	80.00	10,370.60	7,644.36	34,488.56	UG/L
MANGANESE	51	80.39	1,798.04	5,027.04	17,658.34	UG/L
MOLYBDENUM	33	27.27	33.46	39.12	165.51	UG/L
NICKEL	35	37.14	50.68	116.39	438.78	UG/L
POTASSIUM	41	48.78	3,386.23	3,069.81	13,071.50	UG/L
SELENIUM	36	38.89	3.31	3.72	15.64	UG/L
SILICON	11	100.00	8,408.18	3,027.84	23,029.71	UG/L
SILVER	32	31.25	10.05	25.69	97.35	UG/L
SODIUM	53	88.68	12,005.80	5,016.89	27,834.09	UG/L
STRONTIUM	42	61.90	506.16	476.35	2,009.06	UG/L
TIN	35	37.14	94.03	190.89	730.54	UG/L
VANADIUM	41	51.22	117.09	280.76	1,002.88	UG/L
ZINC	50	82.00	195.22	431.42	1,556.36	UG/L

Appendix 5

Treatment Effectiveness



Notes: · For contaminants that neither strip nor adsorb a minimum value was used
· Some contaminants appear more than once

Figure 3.2
Air Stripping / Activated Carbon Matrix

SOURCE: "The UV/Oxidation Italics Handbook," 1994, Solarchem Environmental Systems.

Figure 3.2 - Continued

REGION	COMPOUND	k (mg/g carbon)	H (atm/mole fraction)	REGION	COMPOUND	k (mg/g carbon)	H (atm/mole fraction)	REGION	COMPOUND	k (mg/g carbon)	H (atm/mole fraction)
8	ACENAPHTHENE	140.00	13.39	5	DICHLOROETHYLENE,1,1-	0.15	1270.00	8	NAPHTHALENE	123.00	68.27
8	ACENAPHTHENE	190.00	13.39	6	DICHLOROETHYLENE,1,1-	4.91	1270.00	8	NAPHTHALENE	132.00	68.27
8	ACENAPHTHENE	628.00	13.39	5	DICHLOROETHYLENE,1,2-TRANS-	3.05	370.70	8	NAPHTHALENE	277.00	68.27
7	ACENAPHTHYLENE	115.00	6.33	2	DICHLOROMETHANE	0.88	137.60	4	NAPTHALENE	8.18	68.27
7	ACENAPHTHYLENE	266.00	6.33	7	DICHLOROPHENOL,2,4-	85.16	0.16	7	NITROBENZENE	68.00	1.32
1	ACETONE	2.65	2.38	3	DICHLOROPHENOL,2,4-	16.20	0.16	7	NITROBENZENE	124.69	1.32
1	ACRYLONITRILE	1.40	4.89	3	DICHLOROPHENOL,2,4-	41.40	0.16	7	O-CRESOL	50.07	0.05
8	ALDRIN	299.60	27.56	7	DICHLOROPHENOL,2,4-	131.00	0.16	9	P-XYLENE	85.00	336.90
8	ALDRIN	651.00	27.56	7	DICHLOROPHENOL,2,4-	157.00	0.16	8	PCB 1221	242.00	12.67
7	ANTHRACENE	330.00	4.78	4	DICHLOROPROPANE,1,2-	5.86	148.60	7	PENTACHLOROPHENOL	100.00	0.16
7	ANTHRACENE	376.00	4.78	3	DIELDRIN	38.90	3.24	7	PENTACHLOROPHENOL	150.00	0.16
5	BENZENE	0.04	309.00	7	DIELDRIN	277.66	3.24	7	PENTACHLOROPHENOL	260.00	0.16
5	BENZENE	1.00	309.00	7	DIELDRIN	606.00	3.24	7	PENTACHLOROPHENOL	736.57	0.16
5	BENZENE	3.18	309.00	7	DIMETHYLPHENOL,2,4-	78.00	0.94	7	PHENANTHRENE	135.00	2.18
3	BENZO(a)PYRENE	33.60	0.03	7	DIMETHYLPHENOL,2,4-	108.00	0.94	7	PHENANTHRENE	215.00	2.18
1	BENZOIC ACID	0.76	0.00	7	DIMETHYLPHENOL,2,4-	70.00	0.94	7	PHENANTHRENE	273.00	2.18
7	BENZOIC ACID	51.00	0.00	7	DIMETHYLPHENOL,2,4-	184.00	0.94	1	PHENOL	2.17	0.07
7	BHC gamma-LINDANE	256.00	0.03	3	DINITRO-O-CRESOL,4,6-	41.00	0.08	3	PHENOL	13.30	0.07
1	BIS(2-CHLOROETHYL)ETHER	0.09	0.72	7	DINITRO-O-CRESOL,4,6-	237.00	0.08	3	PHENOL	21.00	0.07
7	BIS(2-ETHYLHEXYL)PHTHALATE	11300.00	0.02	1	DINITRO-o-CRESOL,4,6-	0.42	0.08	3	PHENOL	29.00	0.07
4	BROMOFORM	19.60	29.56	7	DINITRO-o-CRESOL,4,6-	169.00	0.08	3	PHENOL	49.80	0.07
6	CARBON TETRACHLORIDE	6.80	1634.00	3	DINITROPHENOL,2,4-	9.87	0.00	3	PHENOL	50.00	0.07
6	CARBON TETRACHLORIDE	11.10	1634.00	3	DINITROPHENOL,2,4-	18.40	0.00	7	PHENOL	77.40	0.07
6	CARBON TETRACHLORIDE	49.03	1634.00	3	DINITROPHENOL,2,4-	33.00	0.00	7	PHENOL	78.10	0.07
7	CHLORDANE	245.00	2.86	1	DIOXANE,1,4-	1.73	0.00	2	PHENOL PH 11.3	5.66	0.07
7	CHLORO-m-CRESOL,p-	124.00	0.14	7	DIPHENYLHYDRAZINE,1,2-	16000.00	0.00	3	PROPYLPHENOL,4-	19.00	0.47
9	CHLOROBENZENE	91.00	252.10	7	DIPHENYLHYDRAZINE,1,2-	16000.00	0.00	7	PROPYLPHENOL,4-	87.20	0.47
9	CHLOROBENZENE	125.40	252.10	7	ENDRIN	456.50	0.02	7	PYRENE	65.60	0.28
4	CHLORODIBROMOMETHANE	4.80	43.50	7	ENDRIN	666.00	0.02	7	PYRENE	389.00	0.28
5	CHLOROETHANE	0.59	384.40	1	ETHANOL	0.01	0.45	8	STYRENE	120.00	146.30
5	CHLOROFORM	2.60	22520.00	5	ETHYLBENZENE	0.10	446.80	8	TETRACHLOROETHANE,1,1,2,2-	64.96	18.34
6	CHLOROFORM	7.80	22520.00	9	ETHYLBENZENE	53.00	446.80	4	TETRACHLOROETHANE,1,1,2,2-	10.60	18.40
6	CHLOROFORM	8.04	22520.00	7	FLUORANTHENE	88.10	0.36	9	TETRACHLOROETHYLENE	50.80	1492.00
6	CHLOROFORM	18.20	22520.00	7	FLUORANTHENE	242.00	0.36	9	TETRACHLOROETHYLENE	108.17	1492.00
7	CHLOROPHENOL,2-	51.00	0.57	7	FLUORANTHENE	664.00	0.36	5	TOLUENE	0.09	353.10
7	CHLOROPHENOL,2-	88.00	0.57	7	FLUORENE	196.00	6.50	5	TOLUENE	0.81	353.10
7	CHLOROPHENOL,2-	240.00	0.57	7	FLUORENE	330.00	6.50	6	TOLUENE	26.10	353.10
2	CHRYSENE	6.07	0.06	7	FLUORENE	674.00	6.50	6	TOLUENE	40.20	353.10
7	CHRYSENE	716.00	0.06	4	HEPTACHLOR	25.54	82.22	8	TRICHLOROBENZENE,1,2,4-	157.00	78.89
7	CRESOL,2-	73.40	0.05	6	HEPTACHLOR	1220.00	82.22	4	TRICHLOROETHANE	25.55	41.00
3	CRESOL,3-	37.50	0.04	7	HEPTACHLOR EPOXIDE	1040.00	1.76	5	TRICHLOROETHANE,1,1,1-	2.48	226.67
7	CRESOL,3-	56.00	0.04	9	HEXACHLOROBENZENE	450.00	22890.00	4	TRICHLOROETHANE,1,1,2-	5.81	53.37
1	CRESOL,4-	2.98	0.02	9	HEXACHLOROBUTADIENE	258.00	1422.22	4	TRICHLOROETHANE,1,1,2-	26.20	53.37
3	CRESOL,4-	9.97	0.02	9	HEXACHLOROCYCLOPENTADIENE	370.00	888.89	6	TRICHLOROETHYLENE	28.00	648.20
7	DDT,p,p'-	322.00	2.16	9	HEXACHLOROETHANE	96.50	1243.00	6	TRICHLOROETHYLENE	36.30	648.20
1	DI BUTYL PHTHALATE	0.43	0.02	1	HYDROXYBENZOIC ACID,4-	2.14	0.00	6	TRICHLOROETHYLENE	45.00	648.20
7	DI-n-BUTYL PHTHALATE	220.00	0.02	1	ISOPROPANOL	0.28	0.62	9	TRICHLOROETHYLENE	51.62	648.20
7	DIBENZO(a,h)ANTHRACENE	69.30	0.00	7	LINDANE	106.02	0.03	6	TRICHLOROMONOFLUOROMETHANE	5.60	6765.00
8	DICHLOROBENZENE,1,2-	129.00	183.90	3	M-CRESOL	48.87	0.04	3	TRICHLOROPHENOL,2,4,6-	16.95	0.22
8	DICHLOROBENZENE,1,3-	118.00	180.10	6	MERCURY	20.00	633.33	7	TRICHLOROPHENOL,2,4,6-	130.10	0.22
9	DICHLOROBENZENE,1,4-	121.00	240.50	3	METHOXYPHENOL,4-	4.38	0.74	7	TRICHLOROPHENOL,2,4,6-	219.00	0.22
4	DICHLOROBROMOMETHANE	7.90	117.78	2	METHYLENE CHLORIDE	1.30	137.60	7	TRICHLOROPHENOL,2,4,6-	137.00	0.22
6	DICHLOROETHANE,1,1,1-	7.51	326.20	4	METHYLTERBUTYLETHER (MTBE)	4.30	16.3	7	TRICHLOROPHENOL,2,4,6-	155.00	0.22
5	DICHLOROETHANE,1,1-	1.79	326.20	1	N-NITROSODIMETHYLAMINE (NDMA)	0.01	0.00	5	VINYL CHLORIDE	0.01	1544.44
2	DICHLOROETHANE,1,2-	3.57	65.44	7	N-NITROSODIPHENYLAMINE	220.00	0.00	5	XYLENE,o-	0.12	232.50
6	DICHLOROETHYLENE,1,1-	13.25	1270.00	8	NAPHTHALENE	58.00	68.27	9	XYLENE,p-	303.00	336.90

Sources: EPA RREL Treatability Database and Chemical Engineering (November 1 1)

ATTACHMENT 2

Revised Present Landfill Passive Seep Interception and Treatment System Design for a Minor Modification to the Proposed Action Memorandum

Background

During discussions between the Colorado Department of Public Health and Environment, the Department of Energy, Kaiser-Hill, Rocky Mountain Remediation Services, and the Environmental Protection Agency, it has been determined that the Granular Activated Carbon (GAC) treatment system currently being utilized at the OU7 Landfill is ineffective for the volatile organic compounds (VOCs) identified in the seep at levels exceeding steam standards-based ARARs. Therefore, an alternative method of passive treatment (aeration) is appropriate. The following proposal outlines this simplified method.

1) *Discharge line* - The current bypass line is the preferred discharge line due to several factors. The current bypass line has a conveniently located discharge point which can be freeze protected and has proper elevation. The bypass line will be covered with a minimum of six inches of dirt in order to protect the line from freezing. In contrast, the current configuration would require an extension of the pipe which could not be easily freeze protected because it would extend vertically to achieve the proper elevation.

2) *Splash pad* - A large tile of flagstone will be positioned approximately twelve inches below the discharge line to obtain a splashing effect and significant surface contact area. The flagstone will be angled one inch per foot (approximately eight degrees) to ensure the water flows down to additional tiers of flagstone and does not bypass them.

3) *Flagstone tiers* - Three (possibly four) tiers of flagstone (splash pad is first tier) will be positioned in a manner that allows flow across the surface (angled at one inch per foot) of each flagstone with the water then spilling over onto the next flagstone. The anticipated drop between tiers of flagstone will be approximately six inches.

4) *Gravel layer* - A single layer of two inch thick gravel would be would be placed in the first six feet of the stream flow. The layer of gravel will allow for additional surface contact and serve to slightly agitate the discharge to assist in removing residual VOCs, if any exist.

5) *Installation* - The proposed method utilizes readily available and inexpensive materials. The new system could be completed within two weeks of written approval. In addition, material and labor costs are expected to be minimal.

6) *Decommissioning* - The current system will be decommissioned by closing valves to the system. The drums of GAC and bag filters will be removed from the current process system within two weeks of the startup of the new system and managed appropriately as remediation waste. The two weeks will be utilized to ensure that no problems exist that would immediately require the restart of the original system. The original process equipment, ie. the bag filter assemblies and piping will be left in place until the new system has been evaluated after one year of use.

ATTACHMENT 3

Revised Present Landfill Passive Seep Interception and Treatment System Operational Framework for a Minor Modification to the Proposed Action Memorandum

Purpose

The Modified Proposed Action Memorandum for Passive Seep Interception and Treatment (the PAM), dated March, 1996, stated that:

"(t)he overall objective of the interception system is to eliminate, to the extent practicable, discharge of F039-listed waste contained in the seep water to a surface-water body."

In addition the PAM requires that:

"(c)ompliance with potential applicable or relevant and appropriate requirements for seep water will be addressed, to the extent necessary, to protect human health and the environment through interception and treatment of the seep to reduce concentrations of volatile and semivolatile organic compounds."

Consistent with that statement of objective, this Operational Framework is intended to summarize operational practices and to improve compliance and auditability. The operational framework will:

- present specific performance objectives (ie. chemical-specific ARARs)
- clarify sampling requirements
- document inspection practices
- document conditions for bypass and associated notification
- address project reporting

Performance Objectives

The original PAM (July, 1995) and Revision 1 (March 1996) contain lists of potential ARARs and TBCs. It is necessary to refine the ARARs so that specific performance objects are identified in a manner that is consistent with RFCA.

The Table 1 presents the performance objectives for the system. The constituents included in the table are those volatile and semivolatile constituents identified in the seep for which RFCA Table 1 Surface Water Action Level & Standards are available for Segment 4a & 4b.

Metals are not being included as part of the performance objectives. This is appropriate for two reasons. First, volatile and semivolatile contaminants are the only leachate constituents treated in the system. Second, metals have extremely high background concentrations in RFETS groundwater. When these reasons are combined, surface water quality standards for metals are not relevant or appropriate as measures of system performance.

Sampling Requirements

Complete detail on sampling requirements is provided in the Passive Seep Interception and Treatment System Sampling and Analysis Plan (PSITS SAP). The PSITS SAP is being prepared and will be submitted for review and approval. The PSITS SAP provides information on sampling approach; procedures; data quality objectives; data management and evaluation of analytical results.

Samples will be collected in two locations. First, raw water samples will be collected at the influent to the treatment system in the settling tank. Second, the performance of the PSITS will be measured where the leachate exits the six foot gravel bed. Samples for total metals, VOCs, SVOCs and radionuclides will be collected monthly for one year and semi-annually thereafter.

Inspection

Weekly inspections will be conducted during start-up and optimization. A less intensive inspection schedule will be implemented once a competent, steady-state operation can be maintained. Once implemented, specific conditions (ie. storm events) will trigger additional inspection.

TABLE 1
Passive Seep Interception and Treatment System Performance Objectives

Constituent	RFCA Segment 4a & 4b Standards, ug/l
VOLATILES	
1,1-Dichloroethane	1000*
1,2-Dichlorobenzene	620
1,4-Dichlorobenzene	75
Benzene	1
Chlorobenzene	100
Chloromethane	5.7
cis-1,2-Dichloroethene	70
Ethylbenzene	680
Methylene Chloride	5.0
Tetrachloroethene	0.8 (PQL=1)
Toluene	1,000
Trichloroethene	2.7
Vinyl Chloride	2
Xylenes (total	10,000
SEMI-VOLATILES	
1,4-Dimethylphenol	540
Acenapthene	520
bis(2-ethylhexyl) phthalate	1.8 (PQL=6)
Butyl benzyl phthalate	3,000
Diethyl phthalate	23,000
Di-n-butyl phthalate	2.7 (PQL=10)
Fluorene	1,300
Napthalene	620
Phenanthrene	0.0028 (PQL=10)
Phenol	2,560

*No Segment 4a/4b value available. This is the Segment 5 value.

Bypass

Consistent with the prior verbal agreement, bypass is allowed during periods of high flow from the seep and during maintenance activities. EPA will be verbally notified in instances where bypass continues longer than 72 hours. Other shorter periods of bypass will be included in the quarterly operational report.

Reporting

Operational status and sample data will be documented and incorporated in the Quarterly Report for the Consolidated Water Treatment Facility. In addition, when the results from twelve monthly sampling events are available, the data will be tabulated and submitted in a letter report. Based upon the twelve monthly sampling events, it will be determined whether or not the modified system is attaining ARARs to the maximum extent practicable.